

Section 5.1

Estimating with Finite Sums

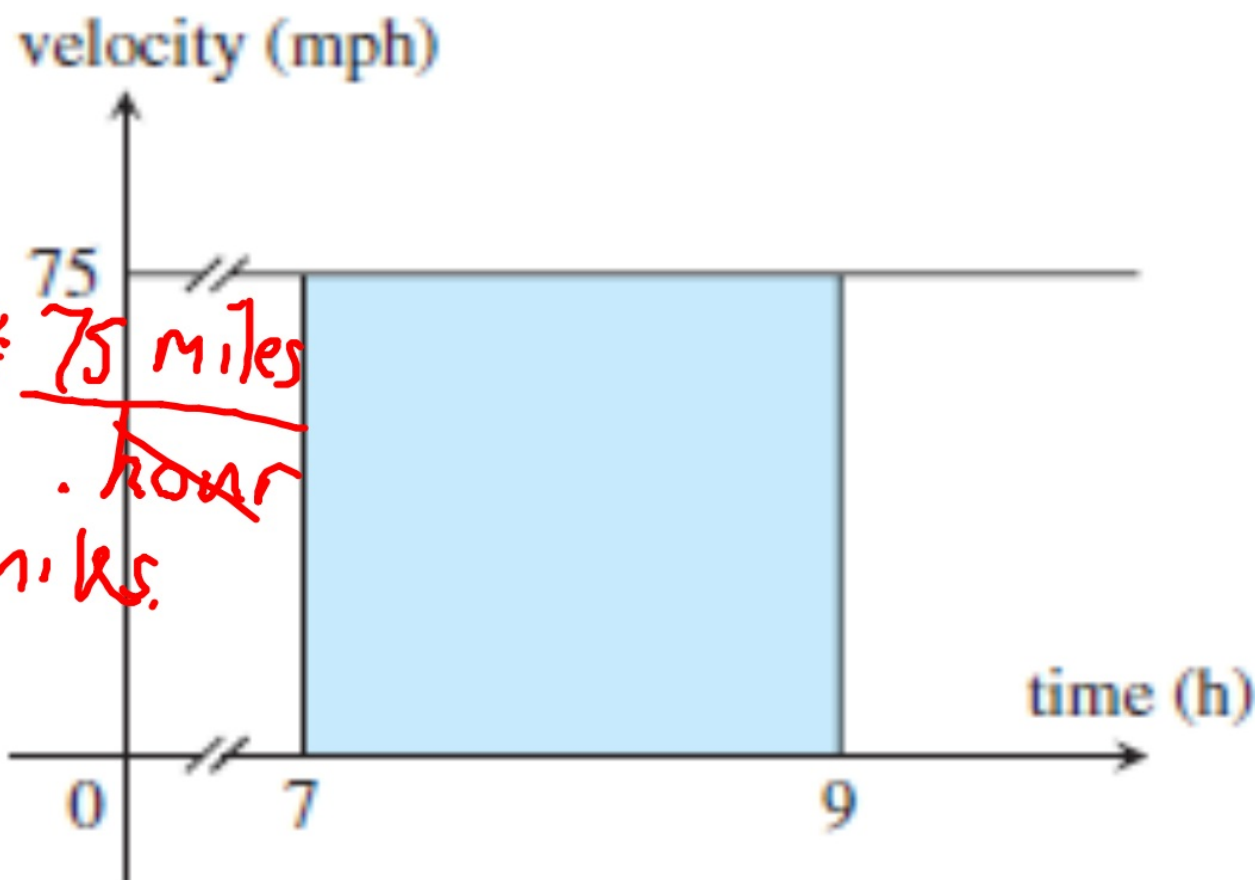
A train moves along a track at a steady rate of 75 miles per hour from 7:00 am to 9:00 am. What is the total distance traveled by the train?

BUT...

$$A = lw$$

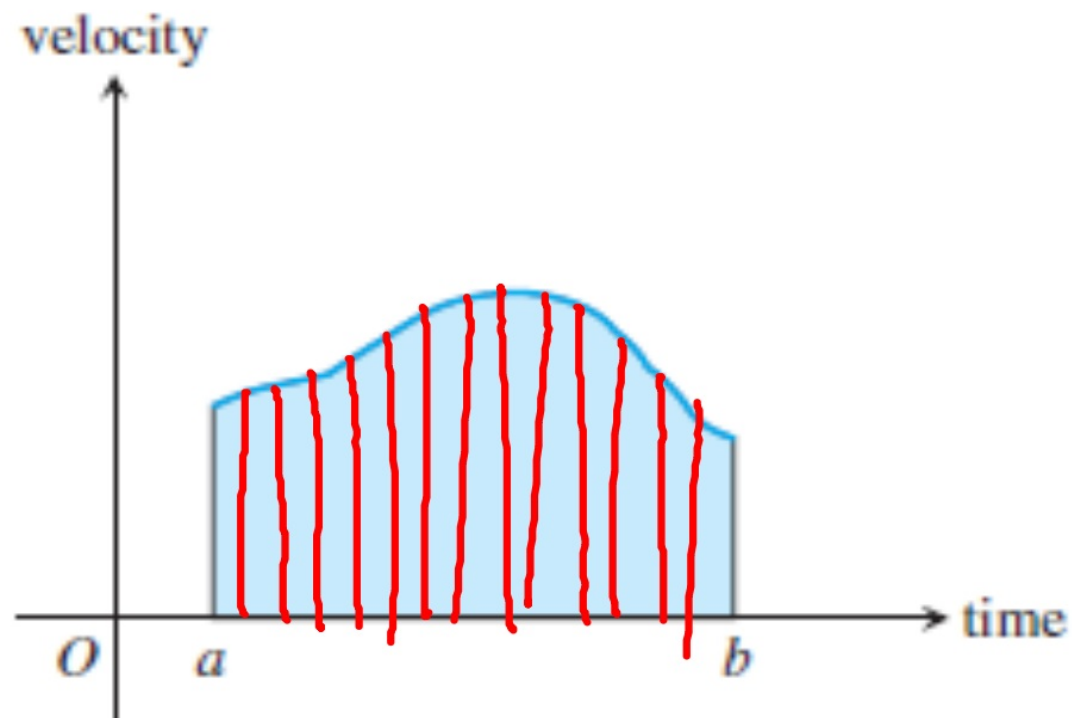
$$= 2 \text{ hours} * 75 \text{ miles}$$

$$= 150 \text{ miles}$$

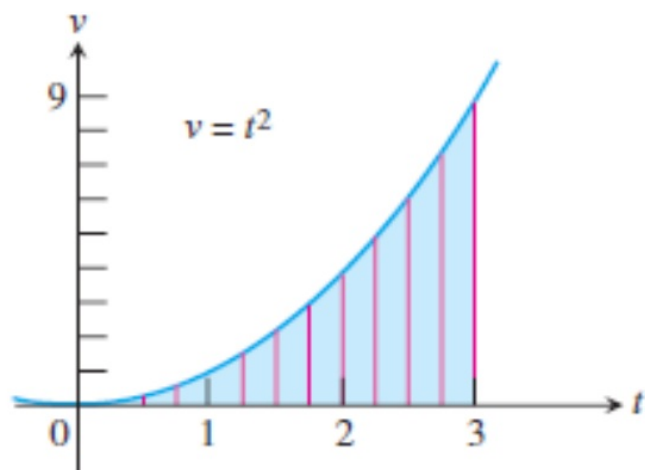


Important to recognize velocity was CONSTANT!

What if velocity isn't constant? What if it varied?



A particle starts at $x = 0$ and moves along the x -axis with velocity $v(t) = t^2$ for time $t \geq 0$. Where is the particle at $t = 3$?



Subinterval

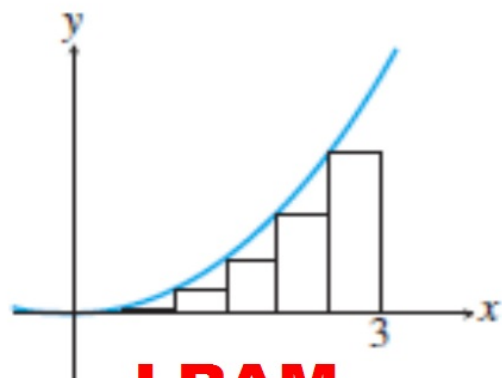
Midpoint m_i

Height = $(m_i)^2$

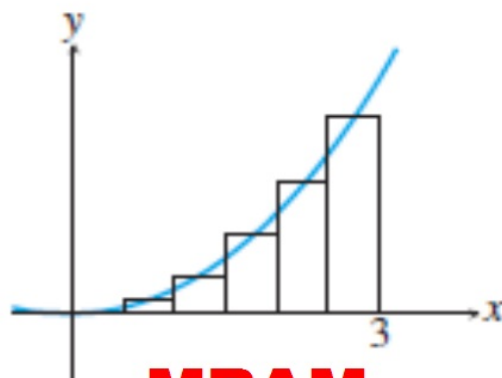
Area = $(1/4)(m_i)^2$



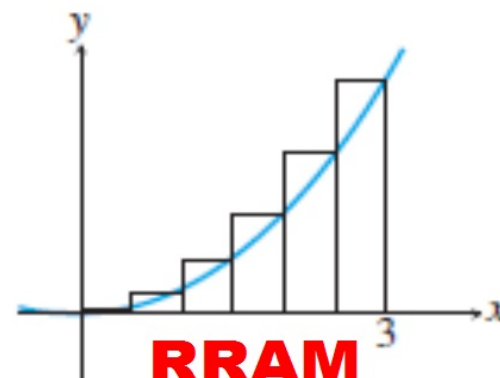
Rectangular Approximation Method (RAM)



LRAM
LEFT



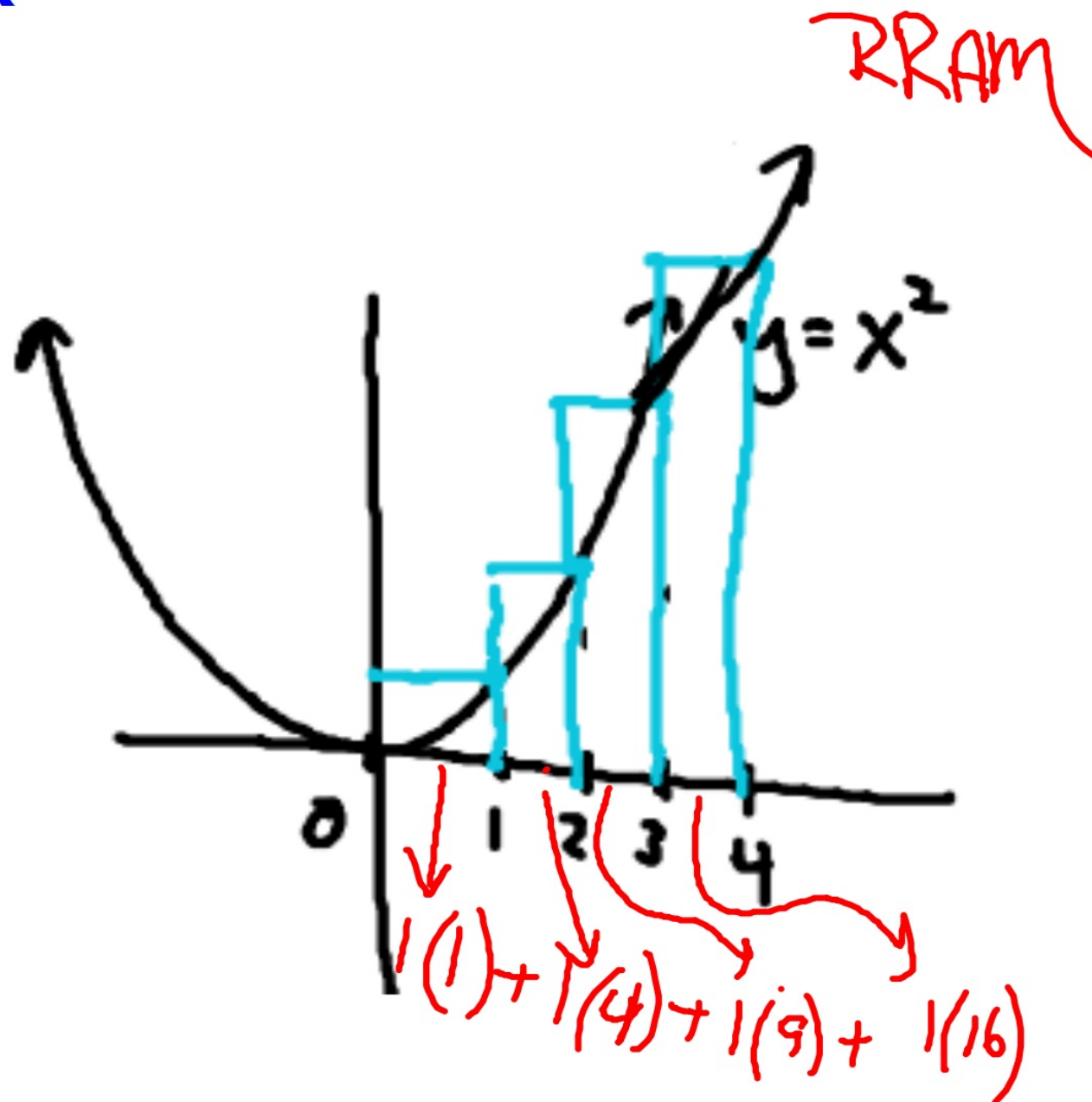
MRAM
MIDPOINT



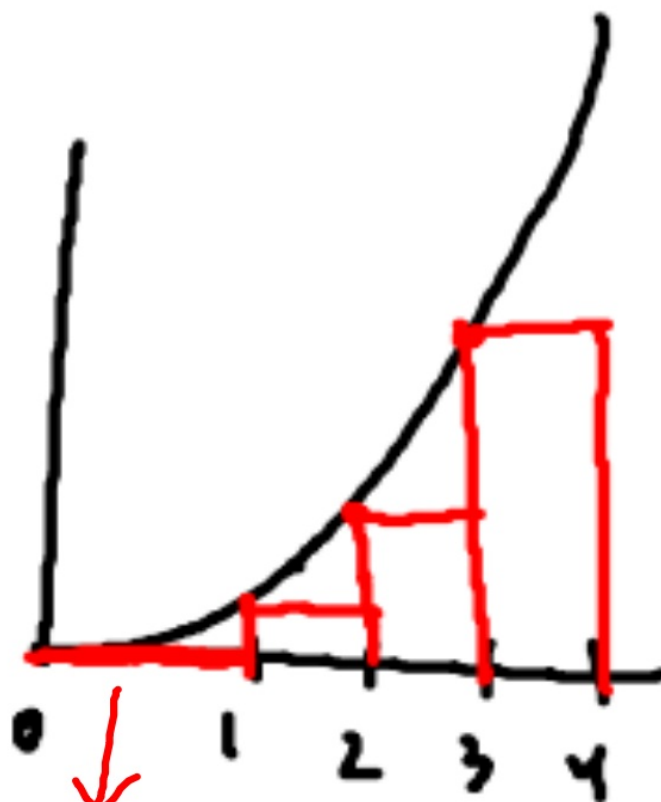
RRAM
RIGHT

Approximate the area under the curve
 $y = x^2$ from $x = 0$ to $x = 3$ with 6 subintervals

From $y = x^2$



From $y = x^2$

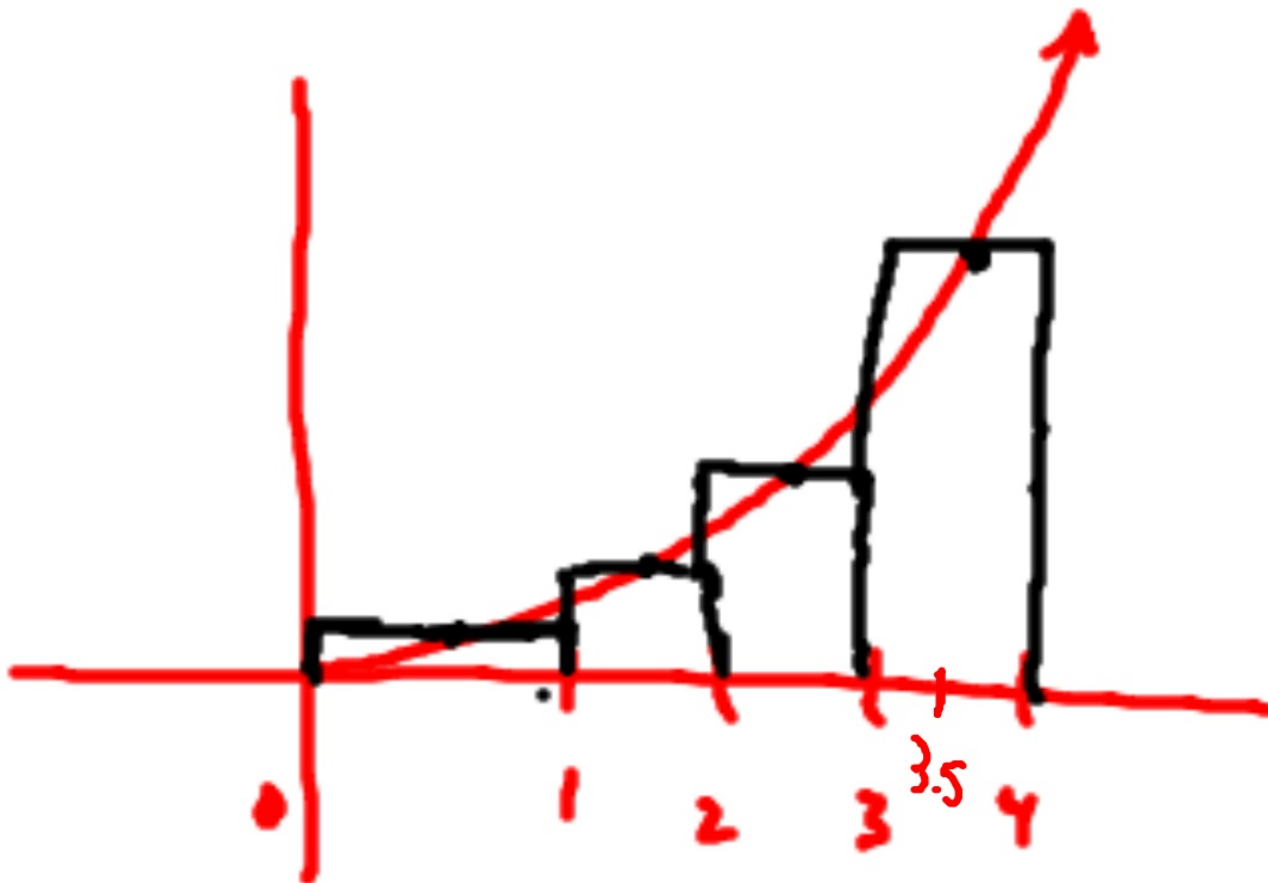


$$0 + 1 + 4 + 9 = 14$$

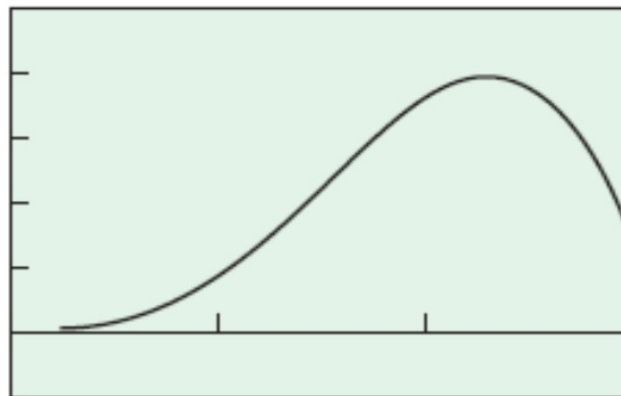
From $y = x^2$

MRAM

$$3\frac{1}{2} = 3.5$$



The figure shows the graph of $f(x) = x^2 \sin x$ on the interval $[0, 3]$. Estimate the area under the curve from $x = 0$ to $x = 3$.



$[0, 3]$ by $[-1, 5]$

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Numbers 5,6 (b), 9 - 12

